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PRESSURE CORRELATIONS AT A FLUID/STRUCTURE INTERFACE

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The structure of pressure-pressure correlations at the interface of an incompressible steady-state turbulent flow with a rigid boundary was investigated. For the sake of completeness, the absolute value of the correlation between two random varying functions is herein defined as a number greater than or equal to zero and less than or equal to unity which is a measure of that fraction of one of the functions that "follows" the second function (or vice versa). It was found that the soughtafter correlations can be determined by consideration of the high Re Navier-Stokes equation, but that the complexity of boundary layer turbulence, in particular the inhomogeneity perpendicular to the boundary and the anisotropy due to convective flow gradients, makes the structure of said correlations extremely difficult to assess. One of the earlier researchers in this field described the quantity under present consideration as "a quantity which is beyond assessment." Nonetheless, it was found that under some rather simplifying assumptions the determination of the required structure necessitates the formulation of the related structure of second order two-point correlations of turbulent velocity gradients, as well as third order two-point correlations of velocity gradients. The presence of these latter gradients is due to the nonlinearity in the turbulence ("turbulence self-interaction"). Both of these correlations are scaled, although not similarly, by factors dependent upon the magnitude of the convective flow, which can be modeled using a *log law* approximation. Fourth order correlations, although present, can be ignored, since they constitute "higher order terms." In a slightly more complex situation, it was found that convective flow gradients also have to be incorporated. At the moment, no definitive algebraic information peculiar to pressure-pressure correlations is available save in the most highly idealized cases.